In-Field Testing of Life Detection Instruments and Protocols in a Mars Analogue Arctic Environment

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During August of 2003 an expedition including 19 scientists tested various equipment at a series of hotsprings sites on the island of Svalbard. This island is considered a Mars analogue environment due to the presence of hot springs, carbonate terraces and volcanic activity which have produced carbonate rosettes similar to those found in ALH84001. The goal was to test 4 portable instruments for their robustness as field instruments for life detection (for future human missions to Mars), to assess the Mars analogue environments for signs of life, to refine protocols for contamination reduction and to understand the effects of transport on sample integrity by assessing bioloads immediately in the field and then comparing these with laboratory measurements made after transportation.

The instruments used in this investigation were; ATP luminometry which assays for ATP as a measure of metabolic activity; Scalar DG2 hand held digital microscope which enables digital microscopy images to be captured at magnifications of up to x200. Charles River Endosafe unit which uses the Limulus Aemebocyte Lysate assay (LAL) and Mobile PCR, which is manufactured by MJ research.

We were able to detect and quantify bacterial load from several sites including endolithic communities from travertine dry terraces at the site. We have been able to use functional gene analysis in the field to rapidly constrain the types of bacterial activity being undertaken within the hotsprings site. We refined one suite of techniques and protocols to enable primary life detection and characterisation in the field. These techniques could also be used in support of trials of flight hardware being developed to detect microbial life on Mars or elsewhere.

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